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# SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE • OCTOBER 21, 1944

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DETROIT



Jet-Assisted Takeoff

See Page 229

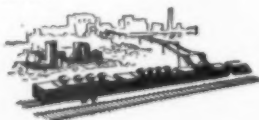
A SCIENCE SERVICE PUBLICATION

## KEEPING UP WITH *Electricity*

**SYNTHETIC FIREFLIES . . .** New Westinghouse fluorescent marker lamp rivals the firefly in economy of light generation. Tiny lamp, consuming only 1/10th watt, will prevent mishaps on dark stairsteps. Unlike lightning bug, it can be kept glowing continuously—at practically no cost.



**1/30,000,000th OUNCE . . .** That's the weight of a single layer of oxygen atoms the size of an air-mail stamp. Westinghouse research engineers have built a delicate balance that measures the weight of such a microscopic layer of oxide on metal—to determine resistance of special alloys to high temperatures.



**POWERHOUSE ON WHEELS . . .** The retreating enemy knows that the quickest way to paralyze a city is to destroy its powerhouse. Advancing Allies know that the quickest way to restore order is to restore power. A 5000 KW power train, built by Westinghouse, moves in on railroad tracks, hooks up to power lines, starts boiler and generator . . . then lights come on, danger of epidemic is reduced, and order emerges.



**INSIDE STORY . . .** Transparent Lucite bearings now permit research engineers to visualize performance of lubricating oil in bearings, subjected to varying operating speeds and pressures. Red pigment shows where oil goes and what it does.



**PREFORMED PLASTICS . . .** New Westinghouse process in plastics manufacture "beats" resins into cellulose fibre, then shapes mixture over perforated copper form. Plastic is peeled off and dried, then placed in heated mold and pressed into final shape. Saves time in making reinforced plastics of intricate shapes.

## Portrait of a Scientist



### creating a better yardstick for testing wartime metals

Spectrum analysis provides the *quickest* and *most accurate* method for checking the composition of metals used in making guns, planes, tanks and ships.

Iron has long been used as a *yardstick* of comparison in spectrography—because of the large number of lines in the iron spectrum.

Formerly, the best standard obtainable was *iron only 99.9 per cent pure*—containing impurities that produced confusing lines in spectrographic pictures.

Westinghouse research engineers tackled the difficult problem of producing a purer iron—a *better* yardstick for testing wartime metals.

They accomplished this by fusing the

purest iron obtainable in a high-frequency induction furnace, surrounded by an atmosphere of hydrogen gas.

**Result: Iron 99.99 per cent pure—containing only 1 part metallic impurities in 10,000 parts of absolutely pure iron!**

Today, this ultra-pure iron is "mass-produced" by Westinghouse at the rate of 1000 pounds per year—and is used in all parts of the anti-Axis world to improve the quality and performance of war material.

A significant contribution, by Westinghouse, to industry at war and in the days of peace to come. *Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pennsylvania.*

# Westinghouse

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## AERONAUTICS

# Jet Propelled Planes

Nazi use of these fighter craft may be the beginning of a new chapter in aerial warfare. Allies are also using jet propelled planes.

►THE RECENT announcement by the War Department of the use of jet propelled fighter planes by the Nazi Luftwaffe may be the beginning of a completely new chapter in aerial warfare. If the new Nazi fighter proves valuable in combat, the day of jet propelled military planes is here. On the other hand, if they wash out it may be some time before these planes, which many engineers believe will have speed, altitude, and other performance characteristics beyond anything previously thought possible, are used in air warfare successfully. We already know that the German jet propelled planes have poor maneuverability, which counteracts the effectiveness gained by their speed.

Although developments in jet propulsion in the United States and Great Britain have been shrouded in wartime secrecy, it is an established fact that both countries have perfected jet propulsion planes. Allied j. p. planes have already been employed in this war in England against the flying bomb, and the experience gained from this tactical use of the plane will certainly be used to improve its flying characteristics so that when we are ready to use j. p. planes against the Axis they will be a highly efficient weapon of war.

Efforts to achieve supersonic speeds in the air have been intensified in this country since the early days of the war when our military intelligence learned of the plans of the Germans to use jet and rocket propulsion for various weapons.

The last investigation made public by the National Advisory Committee for Aeronautics in the United States, before the war, reported that after full developmental work was completed, the jet propulsion plane should be 70% to 80% efficient, or more efficient than any other power system in use, at speeds above those of sound.

The present jet propulsion engine, which eliminates the necessity for propellers, was originally of British design. It was conceived by Flight Commander Frank Whittle, and built by the British Thomson-Houston Company, Ltd., an associate of the General Electric Com-

pany. The engine was sent to this country for further development, and Mr. Whittle spent three months here working with American scientists to produce a jet power plant that is now being manufactured by General Electric in the United States for use in Allied j. p. planes.

The basic principle which underlies jet propulsion has been known since the days of Galileo and Isaac Newton. The present day jet power plant is a successful and ingenious application of one of Newton's laws of motion—the law which says that to every action there is an equal and opposite reaction.

A familiar example of this is the rotary lawn sprinkler. The jets of water go in one direction, and the reaction causes the frame that holds the nozzle to revolve in the opposite direction. You might say that the lawn sprinkler is whirled by jet propulsion.

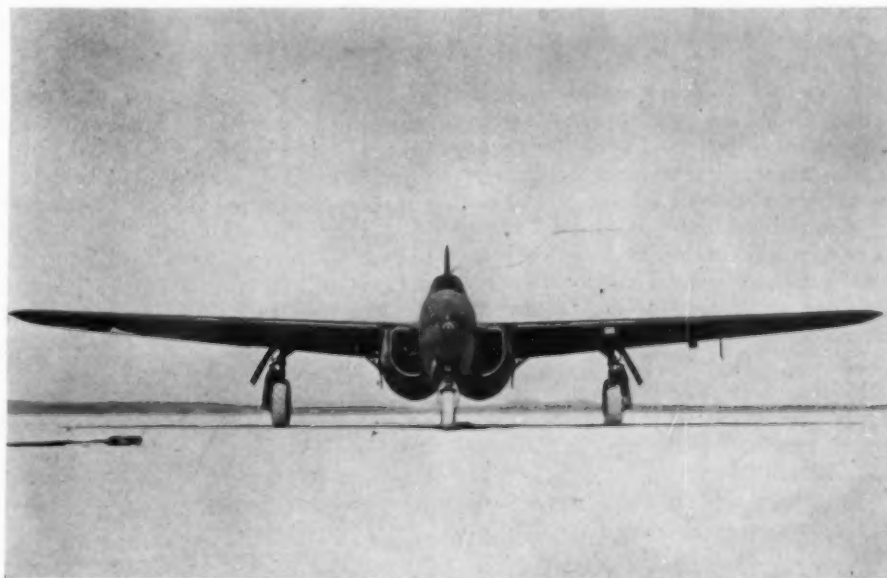
The maiden flight of the first experi-

mental jet propelled airplane in the United States took place on Oct. 1, 1942, just two years ago. The first Army officer to fly the plane was Brig. Gen. Lawrence C. Craigie. Subsequently tests were conducted both in this country and in England by the RAF. Early in January of this year, Gen. H. H. Arnold announced that the j. p. fighter planes had successfully passed experimental tests and soon would be in production. Hundreds of successful flights have been made without accident in the new planes. It is believed that a sufficient number of these planes have already been produced for training purposes.

Pilots who have flown j. p. planes report that they handle easier than the most conventional aircraft, and they are unanimous in their praise of the fact that it has none of the noise (caused by engines and propellers) of a conventional plane, and that it is free from vibration. It takes off like any other plane—not with a squirt and a swish.

Some months ago the NACA fitted standard fighter planes with special engine exhaust stacks which increase the top speed of the plane by 15 miles an hour. This is essentially jet propulsion used to squeeze out a little more horsepower which otherwise would go to waste as exhaust gas.

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**JET-PROPELLED**—This fighter plane has no propellers. This recent photo by the U. S. Army Air Forces shows the first American military aircraft to use jet propulsion motors. The jet motors are located under the wings right at the sides of the fuselage. Produced by Bell Aircraft, it is known as the P-59A Airacomet.



## AERONAUTICS

# Oxygen Lack Prevented

Army Air Forces planes are now equipped with two improved supply systems which make sure that flyers get the right amount of oxygen for safety.

► ARMY AIR Forces planes are now equipped with two improved oxygen supply systems, the Air Technical Service Command reports. These systems make sure that flyers get the right amount of oxygen for safety. Oxygen is life in a bottle for pilots flying at altitudes above 10,000 feet. It prevents anoxia, a condition resulting from deficient oxygen supply to body tissues that may play tricks with flyers' judgment.

One system has a regulator controlled by atmospheric pressure which operates a valve that permits ordinary air to flow at sea level, where no additional oxygen is needed, into the oxygen mask that the pilot wears. As the altitude increases a bellows closes the air valve and opens the oxygen valve, controlling the proportion of air and oxygen until at 30,000 feet, when all air from the outside is shut off and the regulator supplies the flyer with 100% oxygen. Unlike the old manually controlled system, the new system does not waste oxygen, important because on long flights oxygen can become very precious.

New special oxygen containers are provided for flyers and crews who must move around in bombers and transport planes. Called the "walk-around bottle," the container of oxygen is attached to the mask, permitting complete freedom of movement. For flyers who must bail out in a parachute, there is a small bottle of oxygen which provides about five minutes of the precious gas, enough to allow the flyer to descend to the heavier atmosphere where he can breathe normally.

Mobile generating units for taking oxygen out of the air and putting it into bottles are now in operation on all fighting fronts.

So important is the use of oxygen and the maintenance of oxygen equipment, that each AAF Squadron has an officer whose duty it is to see that flying personnel guard their own lives by intelligent use of the oxygen equipment.

Anoxia is the most subtle of all the flyer's enemies. At first it creates an illusion of exhilaration and well being. In a short time vision becomes affected, causing instruments, maps, and other

planes to grow hazy. Other senses suffer too, the ears are affected and radio reception is fuzzy and indistinct.

At 10,000 feet the air pressure drops to 10.1 pounds per square inch, from sea level pressure of 14.7 pounds per square inch. That means there is less air in the space of a cubic foot at 10,000 feet than there is at sea level. The air thins out as you go higher.

No matter how rarefied the air may be at any altitude, it still has 21 parts of oxygen in it, but due to the low pressure, a pilot gets less of it in each lungful as the altitude increases. For this reason, oxygen in a bottle is vital to high altitude flight.

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## PHOTOGRAPHY

## New Camera Device For Aerial Photos

► TO IMPROVE the quality of aerial photos and to make it easier for photo reconnaissance experts to put together the hundreds of pictures that make up photo montages used by field commanders in planning military operations, a new device times the taking of photos to provide a uniform percentage of overlap in all photos. Known as the intervalometer, it is designed to click the shutter automatically in one or more aerial cameras at predetermined intervals with a range of from 1 to 120 seconds.

Developed by the Fairchild Camera and Instrument Corporation, the controls of the new device are installed on the instrument panel of the plane. The aerial photographer can operate by this remote control system cameras which may be back in the tail of the plane. As many as seven fully automatic aerial cameras are operated in synchronization by one controlling device.

In addition, there is an extra-picture switch button, permitting the aerial photographer to take an extra picture if he happens on an unusual subject that does not fall within the interval timing, without interrupting the predetermined scale. A thermostat-controlled electric heater keeps the equipment at uniform temperatures during high altitude flight.

The resulting overlap provides the same area coverage in any given strip of pictures. This results in a uniform percentage of overlap in all photos taken from an identical altitude but to different scales.

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*Esparto grass, Stipa tenacissima*, which covers millions of acres of rugged, almost sterile, land in Tunisia, Algiers and Morocco, is used to make hats, shoes, carpets and brooms, and as cattle feed, fuel and a base for paper.

## SCIENCE NEWS LETTER

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## BALLISTICS

# Speed of Bullet Clocked

New electronic device registers the flight of projectile accurately to 1/100,000 of a second. Makes more efficient firing possible.

► ARMY AND Navy guns are firing more effectively these days as the result of tests made possible by a new electronic time-interval counter, now in use at the Aberdeen Proving Ground and at other government installations. The new device, precise to 1/100,000 of a second, supplies instantaneously data upon which the performance of a given gun is established and the uniformity of its ammunition checked within a few seconds.

The time-interval counter can be used on any type of gun, from small hand weapons to the more powerful 16-inch rifles. It was developed under the direction of Igor E. Grosdoff, research engineer of the RCA Laboratories.

Each test firing range is equipped with two electrical coils, arranged so that a projectile will pass through them one after the other. By magnetizing the projectile before it is fired, a small electrical signal is produced in each coil as the bullet passes through. In actual use, if

the coils are 30 feet apart, and the time elapsing between signals is one one-hundredth of a second, the bullet is traveling at 3,000 feet a second.

The electronic counter is made up of three essential parts: an oscillator, a gate, and the counter itself. The oscillator, regulated by a vibrating quartz crystal, delivers exactly 100,000 electronic pulses a second. The gate, which is really a vacuum tube circuit, passes these pulses into the counter, which counts each pulse. The counter's gate is opened by an electrical signal from the first coil as the bullet passes through it, and is closed again by the impulse from the second coil.

Indicator lamps show the number of pulses that have passed through between the time that the gate is opened and closed, showing the number of hundred-thousandths of a second during the interval. The operator records the time of flight between coils and computes the ve-

locity. These data are jotted down, along with the record of the particular projectile being tested, for analysis later by ballistic experts.

If all shells from a gun leave the muzzle with the same velocity, they will all fall on the same spot, and the effectiveness of fire will depend only upon the aim and skill of the gunner. To insure this consistent performance, ordnance scientists constantly measure muzzle velocities of all types of guns and with all kinds of powder loads and shells.

*Science News Letter, October 7, 1944*

## AERONAUTICS

## Navy Is Now Using Jet Propulsion Takeoffs

See Front Cover

► JET UNITS now used by the Navy reduce normal takeoff runs of Navy planes up to 60 per cent, and allow for an increase in loads. The official photograph on the front cover of this SCIENCE NEWS LETTER, shows a "profile" view of a heavy Avenger as it springs aloft with the assistance of four 330-horsepower jet units.

Of particular value on the restricted area of carrier flight decks, JATO, as jet-assisted takeoffs are known in the Navy, will also be extremely useful for lifting heavily-laden flying boats from the water. Resembling bombs, except that they are affixed to the fuselage rather than under the wings or enclosed in bays, jet units contain solid propellents which include oxygen, and are ignited by electrically controlled spark plugs. The escaping stream that follows gives planes the thrust.

*Science News Letter, October 7, 1944*

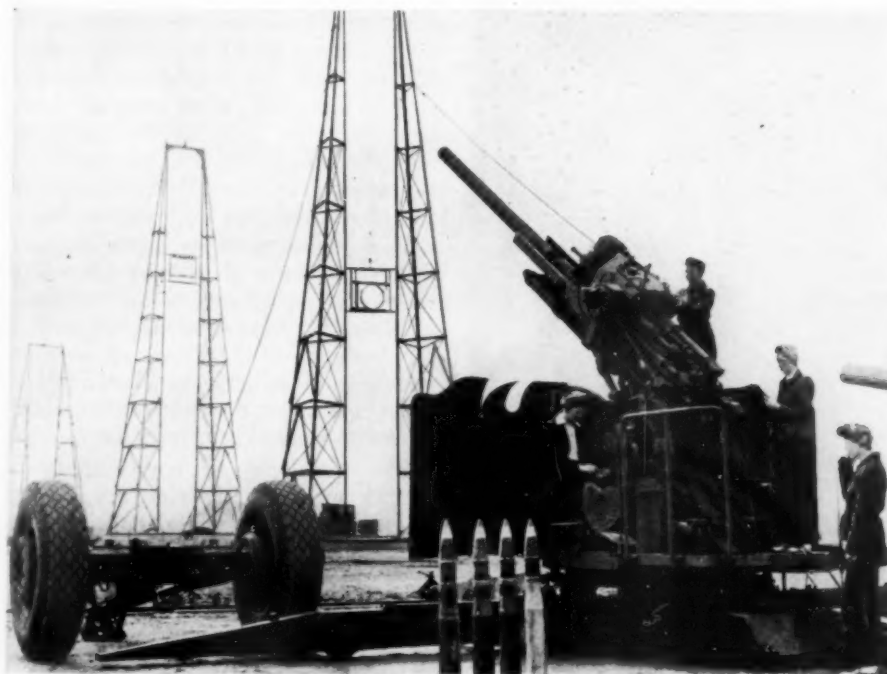
## PUBLIC HEALTH

## The Polio Epidemic Is Dying Out Slowly

► THE INFANTILE paralysis epidemic is dying out slowly, increases in cases still being reported in the New England area. For the nation as a whole in the week ending Sept. 23, a total of 1,159 cases were reported by state health officers to the U. S. Public Health Service in Washington.

Although the peak of the epidemic, so far as reports are concerned, was reached the week ending Sept. 2, there probably will be many new cases reported during the coming weeks. The low point is not expected before December.

*Science News Letter, October 7, 1944*



**BULLETS CLOCKED**—The range velocity towers record the speed of the shell from this big 90-mm gun through space. The shell is magnetized so that when it passes the hoops it sets up an electric current which is automatically recorded and timed.

GENERAL SCIENCE

# Science Calls Youth

The annual Science Talent Search seeks promising high school seniors. Scholarships are awarded the 40 winners, often laying foundations for careers.

► SCIENTISTS are beginning to turn their minds toward the problems and tasks of peace, even while they still help fighting men to redouble the weight of their blows for a quick knockout of the reeling enemy. Greatest of all scientific advances, however, is in the field of training young men and women.

Nor are signs lacking that our young people are ready for the challenge of the future. Even in the present disturbed condition of our colleges and technical schools, with the bulk of the young men in uniform, there is a multiplied interest in scientific research and in its applications.

Many other boys are not yet of military age, or have been disqualified for physical reasons. And, of course, approximately half the potential student body are girls, most of them under age for enlistment in the WACs, WAVEs and other women's branches of the service.

So the student ranks are filling up, even though the count is a bit out of balance on the coed side.

The essential normality of student attitudes even in these abnormal times is well illustrated by reports on their own activities sent in by winners of the Science Talent Search, a nationwide scholarship contest administered each year by Science Service, with funds supplied by the Westinghouse Electric & Manufacturing Co. Science Clubs of America has already conducted three of these searches, specifically designed to discover the most gifted high school graduates in science, and the 120 winners are now either in college or the armed forces.

Early in each school year, invitations are sent to all public, parochial and private high schools to enter their most promising senior science students in the contest. The thousands of ambitious youngsters who respond are given a stiff

aptitude test, and put over a number of other difficult scholastic hurdles before the contest ends in December.

The fortunate 40 are brought to Washington for a personal looking-over by a panel of judges trained both in science and in sizing up people. The interviews are spread over several days, and for several hours daily the young people attend the Science Talent Institute especially arranged for them, at which they are addressed by some of the most eminent scientists in the country. It isn't all seriousness and hard work, however; they are given a fair taste of Washington sight-seeing, including a call at the White House and visits with their own congressmen and senators.

On the final evening, after a big dinner, the decisions are made known and the awards distributed. The top-ranking boy and girl among the 40 each receives a scholarship good for \$2,400—\$600 each year for four years. Lesser sums, but all substantial, are awarded to the other 38.

So eager are American universities and colleges to have these prize students on their campuses that additional scholarship grants are invariably offered not only to the two top winners but to every one of the 40. One girl wrote to Science Service that had she been able to accept all the scholarships offered her she would have received a total of \$36,000!

Of the 120 who placed highest during these annual searches, 88 were boys, 32 were girls. Of the 88, latest reports show that 41 have been inducted into the armed services. Twenty-one of these, however, were classified V-12 and assigned to college work in medicine and engineering for the Navy. Three are studying in the same fields for the Army.

The others, now on active military duty, have been given jobs for which their natural inclinations and scientific training, even in high school, had already fitted them—such things as aviation weather service, care of electrical and radio equipment, direction-finding evaluation and medical laboratory work.

The remaining 47 boys still unducted, and all of the girls, are digging in on their college work as their No. 1 jobs. But their reports show the characteristic versatility and adaptability of typical American students, especially in the kind of summer jobs they held, and the part-time employment they find for themselves on the campus.

Two of the girls, Evelyn Pease of Evansville, Ind., and Marguerite Killingbeck of Nyack, N. Y., quite literally held the lives of many (Turn to Page 234)



**YOUNG SCIENTISTS**—Pfc. Allen E. Voigt of Salem, Oregon, (left) works in an Army medical laboratory, where his natural bent for biology helps in tracking down trouble-making germs of malaria and other diseases. Evelyn Pease, of Evansville, Indiana (right), tests already-known sulfa compounds, and has helped synthesize some new ones.



PHYSICS

# Helium, Sun Gas

The United States has a world monopoly on this element, useful in the air, in hospitals and for deep-sea divers.

By ROBERT N. FARR

► ONE SCIENTIFIC research baby, born a-fighting in the first World War, fighting again in this war, now looks forward to an even more useful career in peacetime. It is helium, the light-weight among non-burnable gases.

Uncle Sam has a world monopoly on the large-scale production of this gas, known to science as chemical element No. 2. So rare was helium in 1917 that it sold at a rate of \$2,500 a cubic foot, but it is so plentiful now that Uncle Sam extracts millions of cubic feet of it at less than a cent per cubic foot.

No one will ever see helium gas. It is completely colorless, odorless and tasteless.

This "invisible gas" lifts Navy blimps, used to ferret out Nazi U-boats. It carries meteorological balloons to stratospheric altitudes, gaining weather data vital to the success of military and naval operations. Deep beneath the sea it helps reduce the danger while divers do their work. In war plants it helps curb explosion hazards. Doctors use it in treating respiratory diseases.

Uncle Sam controls the production and distribution of helium through the Department of the Interior, with the Bureau of Mines actually drilling the gas wells, and building the plants in which helium is extracted from the natural hydrocarbon gases, piped from deep beneath the earth's crust.

Most helium-yielding gas wells are in the southwestern part of the United States, particularly in Texas, Kansas and New Mexico.

## "The Sun Gas"

Helium was named "the sun gas" because it first was detected in the sun's spectrum in 1868 as a strange new yellow line. Later it was discovered on earth in certain minerals, and more recently in natural hydrocarbon gases.

No helium is being produced commercially from any source outside the United States today. However, there is a potential yield of 200,000 cubic feet a

day from the gas that pours forth from boric acid fumaroles in Italy. Canada also has some natural gases that contain a small percentage of helium.

At the close of World War I the desirability of helium as a lifting agent was well established, its value lying in the fact that while its lifting power is 92% of that of hydrogen, lightest of all gases, it forms no dangerous explosive mixture with air, which hydrogen does.

Twenty-five years of research has barely scratched the surface of the possibilities for the industrial, scientific, and medical uses for the "sungas." Helium is now available in large quantity for research and commercial applications.

A list of present and possible future uses of helium includes use as a food preservative, an extinguisher for fires, a cleansing agent to remove impurities from molten metals, in the development of explosion-proof motors, in refrigeration to produce ultra-sub-zero temperatures, in optical instruments, and as a tracer ele-

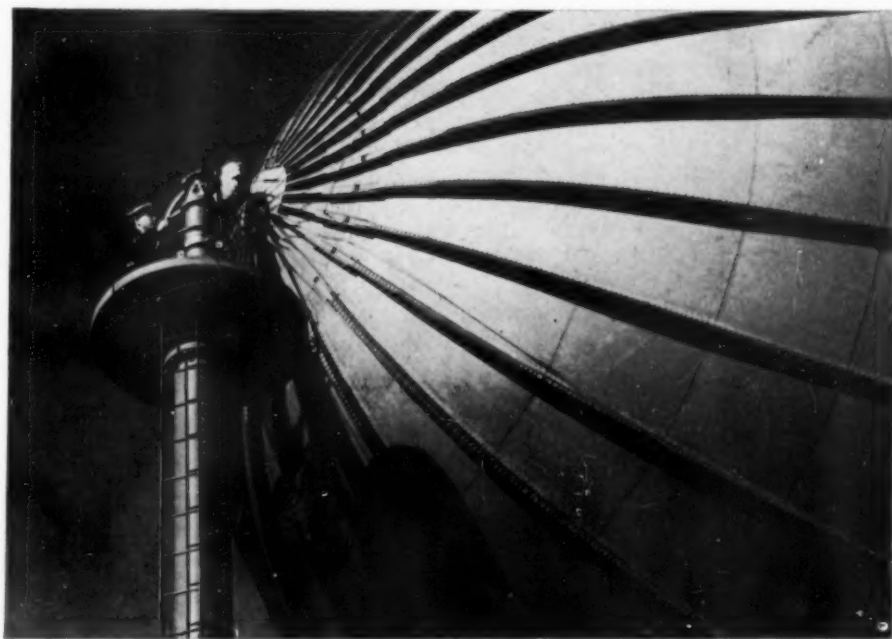
ment to determine migrations of underground deposits of natural gas.

New techniques of studying weather require the use of large balloons to carry heavy meteorological equipment to high altitudes. Because it explodes and burns, the use of hydrogen to lift these balloons proved to be quite dangerous, therefore the U. S. Weather Bureau now uses helium to help get weather predictions.

In the medical field the sun element has been used for more than 20 years in experiments and in actual practice in preventing caisson disease, or "bends," in deep-sea divers, tunnel workers, and others forced to work in atmospheres of relatively high pressure.

## Aids Deep-Sea Diving

The old method of using compressed air in deep-sea diving limited the depth to which a diver could safely go to little more than 250 feet. At this depth the increased oxygen made the diver lose part of his ability to think, and as a result he could work less than one hour at that depth. It also required up to four hours for the diver to return to the outside air in order to avoid the "bends," which is due to nitrogen bubbles coming out of his body (*Turn to Page 238*)



**FILL HER UP!**—That is just what is being done to this Navy blimp. The helium provides lifting power for ships used for coastal patrol work.

## MEDICINE

## Penicillin Production Speeded by Use of Radium

► **PENICILLIN** production schedules can be speeded by two or three days through the use of radium or other radioactive substances, it appears from a report by Dr. Richard Jahiel, Miss Ethel Guberman and Rafael Kazdan, of the Biochemical Research Laboratories of the Canadian Radium and Uranium Corporation, (*Science*, Sept. 29).

Basis for the experiments of the Canadian scientists is the fact that minute amounts of radium emanation, or other radioactive substances, have an exciting action on the growth of living substances although radiation from larger doses has a destroying power.

When porcelain tubes containing radium were added to the bottles in which the mold, penicillium, was growing, the peak of penicillin secretion came at least two or three days before it was reached in bottles of mold growing without irradiation.

Adding a fluorescent substance, such as the dye, fluorescein, to the growth medium in which radioactive substances are present improves noticeably the effects of the radioactive elements.

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## NUTRITION

## Blanching Advised For Dehydrated Carrots

► **COMMERCIAL** dehydrated carrots which are to be kept in storage for some time before being used should be blanched before dehydration, Prof. T. E. Weier of the University of California suggested in a report to the Botanical Society of America. Carrots blanched before dehydration retain their coloring and vitamin A considerably longer than those which are not, Prof. Weier found.

By placing rehydrated carrots in moist oxygen at 144 degrees Fahrenheit for 24 hours, Prof. Weier was able to bring about changes in appearance which he felt were similar to those occurring naturally in dehydrated carrots after three to eight months of storage. (*American Journal of Botany*.)

Eight-month-old commercial dehydrated carrots which had not been blanched completely lost their carotene within 24 hours when given this treatment. Carotene is the precursor of vitamin A. Dehydrated carrots of the same age blanched before dehydration, did not lose all their carotene until after 48 hours.

When carrots are heated, the carotene in the cells goes into solution in an unsaturated fat. It disappears from this fat when carrots are heated in moist air to 144 degrees Fahrenheit for 20 hours. The rate of carotene breakdown is speeded by oxygen.

*Science News Letter, October 7, 1944*

## NUTRITION

## Custom of Devitaminizing Vegetables Is Criticized

► **THE ABSURDITY** inherent in first virtually devitalizing our vegetables to make them look pretty and sell well, and then stuffing ourselves with expensive vitamin pills to make up for the lack, was decried by Prof. A. E. Murneek of the University of Missouri at the meeting of the American Association for the Advancement of Science.

It is a long time, he declared, since it has been possible to buy in the market "a carrot that tastes like a carrot," sweet-corn as delicious as old-fashioned golden bantam, and spicy-flavored plums. They have disappeared in favor of products with greater "eye appeal" but poorer flavor and lower vitamin content.

One factor that has helped produce inherently poorer vegetables and fruits, Prof. Murneek continued, has been the necessity for varieties that will stand shipment and keep well. A possible remedy for this situation lies in improved refrigeration and faster transportation including carriage by air, he suggested.

*Science News Letter, October 7, 1944*

## METALLURGY

## Electric Furnace Invented For Extracting Magnesium

► **AN ELECTRIC** furnace for the extraction of the now widely-used light metal magnesium from its ores is the subject of patent 2,355,343, issued to two Swiss inventors, Alfred von Zeerleder and Warner Syz. It differs from other furnaces of its general class in that its heating element, a long carbon rod, is contained within a welded tube thrust up vertically at the very center of the furnace.

The carbon is protected against burning out by being kept in a vacuum or in an atmosphere of one of the inert gases. Its central position makes for more efficient use of the heat it gives off.

The inventors have assigned their patent rights to a Swiss corporation, Société Anonyme pour l'Industrie de l'Aluminium.

*Science News Letter, October 7, 1944*

# IN SCIENCE

## MEDICINE

## Whooping Cough Vaccine Gets Official Approval

► **VACCINATING** babies and small children against whooping cough will probably become a more popular procedure now that three kinds of whooping cough vaccines, the Sauer, the Kendrick and Eldering, and the Harrison and Bell, have been officially approved by the American Medical Association.

"Significant protection" in the way of either escaping the disease altogether or having a less severe attack is conferred by modern vaccines, Dr. Harriet M. Felton and Miss Cecilia Y. Willard, of Philadelphia, report (*Journal, American Medical Association*, Sept. 30). Their report reviews many studies made by various scientific groups.

*Science News Letter, October 7, 1944*

## MILITARY SCIENCE

## Sky-Hook Is Successful For Dropping Food

► **A NEW** device, known as a "sky-hook," will soon be dropping supplies of food, medicine, and mail from cargo planes to military personnel in isolated spots. It is better for this use than a parachute, since in ordinary winds it will land almost directly beneath the point of release.

Developed by the Materiel Command, Wright Field, the sky-hook drops to earth with the movement of the winged seed of the maple tree. The moment that the sky-hook is released it begins spinning directly towards earth without forward motion. Various models can drop loads ranging in weight from ounces up to 100 pounds.

Sky-hooks are made in several models of steel, aluminum, and plastics. They look like a woman's large hat box with a wing stuck on one side. They are about 10 inches thick and 18 to 20 inches in diameter. The cargo container is circular in shape with a slightly rounded bottom. It has a capacity of 2.5 cubic feet, or about 17 gallons. Each sky-hook has a wing, made from spruce or balsa wood, attached to the top of the container. The wings can be quickly removed and are interchangeable among various models.

*Science News Letter, October 7, 1944*



# NEW FIELDS

## MEDICINE

### German Wooden Bullets Hard to Find by X-ray

► WOODEN bullets, which the Germans are said to have used at Cherbourg when hard pressed for ammunition and presumably might use again, are practically invisible in X-ray pictures of the wounds they make, Dr. Norman P. Henderson reports (*British Medical Journal*, Sept. 9).

The wooden bullets are said to be effective up to about 100 yards. At this short range, Dr. Henderson says, the wood breaks up on striking solid structures such as bone and the scattered fragments are not likely to be located by X-rays.

Through the courtesy of a Naval friend, Dr. Henderson was able to study the X-ray appearances of a round of rifle ammunition with wooden bullets instead of the customary metal variety. An X-ray picture made with a complete cartridge and bullet placed between a patient's leg and the film shows the wooden bullet is practically invisible to the rays.

*Science News Letter, October 7, 1944*

## PUBLIC HEALTH

### Geo-Medicine Studies Keep Allied Soldiers Well

► GEO-MEDICINE is one of the words we may all be adding to our vocabularies as a result of the war. It is the branch of medicine that has to do with the geographical distribution of disease and health. Studies of this branch of medicine by medical officers of our Army play a large part in keeping our soldiers healthy, no matter where they have gone to meet and overcome the enemy. And they have gone to some very unhealthy places.

"Had we deliberately selected the battleground that presented the worst hazards to health, we would have departed little from the areas in which our enemies have so far forced us to do battle or to operate our supply lines," says the introduction to a new book, *Global Epidemiology*.

The book (published by Lippincott) is by Brig. Gen. James S. Simmons, chief of the preventive medicine service of the Office of the Surgeon General, U. S.

Army, and Lt. Col. Tom F. Whyne, Lt. Col. Gaylord West Anderson and Maj. Harold MacLachlan Horack, who have been serving in the medical intelligence division of the preventive medicine service.

From Burma to Iceland, from New Guinea to North Africa, wherever our troops have gone or may yet go, medical intelligence has surveyed the health situation, learned what particular dangers exist and how to guard against them.

Here in the United States we associate malaria with swamps. In some parts of the world, however, the malaria mosquitoes breed in running water instead of swamps. In some places they breed in the shade, whereas a few miles away they may breed in the sunshine. Medical and sanitary officers who go with the troops must know when they get to a malarious region the breeding habits of the malaria mosquitoes in that particular region in order to fight the disease successfully.

Information of this kind, assembled by medical intelligence, will have public health value after the war when civilians start flying around the world. So the medical intelligence surveys, except for such material as would affect military security, are now being published.

*Science News Letter, October 7, 1944*

## AERONAUTICS

### CAA Given "Go Ahead" On Marking Program

► RESTRICTIONS against air markers have been lifted by the War and Navy Departments, with the exception of a strip 150-miles wide inland from the West Coast and Alaska, so that the Civil Aeronautics Administration program for erecting 100,000 markers can get underway.

The air markers will provide private pilots and commercial airlines with navigation information that in the daytime will give them their exact location, the direction of true north, and the direction and mileage to the nearest landing fields.

These markers may be made of crushed rock, shrubs, or enameled metal strips, and will be painted at highway intersections, on mountain sides, and on farm buildings in open country. The job of erecting the air markers will be done by civic, state, and aviation organizations as well as major oil companies, under the direction of Blanche Noyes, CAA's Air Marking Specialist, Bureau of Federal Airways.

*Science News Letter, October 7, 1944*

## EDUCATION

### Air Force Technicians Go to School in England

► THOUSANDS of Army Air Force technicians are now in school in England to enable them to keep the big bombers flying against Germany with never a letup caused by maintenance troubles, the War Department has announced.

Training becomes obsolete as fast as airplanes. Each new plane or new piece of equipment requires highly trained technicians to keep it in good working order. There are over 500 different classifications of technical jobs which require special training. These include the general fields of electronics, gun turrets, engines, hydraulics, and instruments.

Instead of sending an expert overseas with every new development, the AAF keeps these training schools in continual operation in England to meet the need for specialists.

About 4,500 sheet metal workers have been trained in these schools, and this represents only a small part of the total number trained. These sheet metal workers patch holes in bombers made by German flak, and have them ready to go back into service to carry another load of bombs in the shortest possible time.

Training is divided into two phases: The men are first taught in schools. Then they receive additional training in the shops and at air fields.

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## AERONAUTICS

### Slot Through Plane Wing Used to Cool Engine

► AN AMERICAN airplane patent of unusual interest is No. 2,352,144, issued to Robert J. Woods of Grand Island, N. Y., and assigned by him to the Bell Aircraft Corporation. This patent is on a slot that goes entirely through the airplane wing from leading to trailing edge, and on the flap that opens and closes it. This radically-cut slot has as one primary objective the carrying of a cooling air blast to the plane's power plant.

A characteristic of certain planes of Bell design, notably the Airacobra, is the placing of the engine far back in the fuselage, behind the pilot's seat; this in turn necessitates getting cooling effects well back. Bell has also taken a leading part in the American development of jet-propelled craft, which also require a cooling blast well toward the rear.

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## From Page 230

wounded and sick fighting men in their hands during the past summer, for they were employed in the laboratories of two pharmaceutical companies that manufacture sulfa drugs, penicillin and other medical necessities for the Army and Navy.

Mary Ann Williams of Troy, N. Y., is another girl who has carried a life-and-death responsibility as part of her summer's work. She made chemical analyses in the Nylon Control Laboratories

at the DuPont Experimental Station in Wilmington, Del. Nylon is the material of which parachutes are made, and the stout but elastic tow-ropes that pull troop-carrying gliders through the air, and a score of other vital items of warriors' gear.

One of the most interesting of summer-time jobs was the one at which Marina Prajmovsky of Farmingdale, N. Y., worked a year ago this summer. This was in the Naval Research Laboratory in Washington, D. C. They gave her bits of captured enemy goods without telling her what they were, and she had to find out what they were made of. These analyses are valuable not only in giving information about what the enemy has but about what he lacks. Shortages in enemy supplies may be so cleverly hidden that only the test-tube and the spectroscope can unmask them.

One of the young men, Arthur Ortenburger, Jr., of Norman, Okla., worked

on a seed farm—a hybrid corn seed farm, where he was supervisor of a pollinator team. Arthur will soon be a student at Harvard Medical College.

Clifford Swartz of Niagara Falls, N. Y., though still an undergraduate, was assigned to a large private laboratory.

Irving William Rozian of Hazel Park, Mich., has worked this summer in research for a pharmaceutical company on the absorption and internal effects of sulfanilamide used in a special preparation for secondarily infected dermatoses. He will enter the University of Michigan in September to take a combined course in Chemical Engineering and Business Administration.

Whatever the tasks have been the Science Talent Search winners have gone at them with all the vim and good nature that have made the American student the admiration of the world.

*Science News Letter, October 7, 1944*

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### POPULATION-PHOTOGRAPHY

## Census by Aerial Maps

This method will be used in 1945 to help locate farm homes and to make agricultural production surveys. Will map 360,000 farms.

➤ AERIAL MAPS will be used by the U. S. Census Bureau in conducting the 1945 Farm Census scheduled to start January 1, Clarence E. Batschelet, chief of the Geography Division of the Census Bureau in Washington, announced.

The technique of aerial photography, now being used widely to prepare vital military maps, has been used in the past by the Department of Agriculture in its soil conservation program. This will be the first time that aerial photos will be used on a wide scale to help census-takers locate farm houses and study agricultural production.

Plans include the aerial mapping of about 360,000 of the 6,000,000 farms in the United States. By mapping only specially selected areas, data will be obtained which will be typical for certain types of agriculture.

The aerial photographs which the Census Bureau will use will come from eight government agencies, including the Department of Agriculture and the Coast and Geodetic Survey.

Many townships and counties in farm areas do not have up-to-date maps. It is impossible, therefore for census workers

to locate recently developed farms and farm residences. The aerial maps will save much time and money in locating these rural properties.

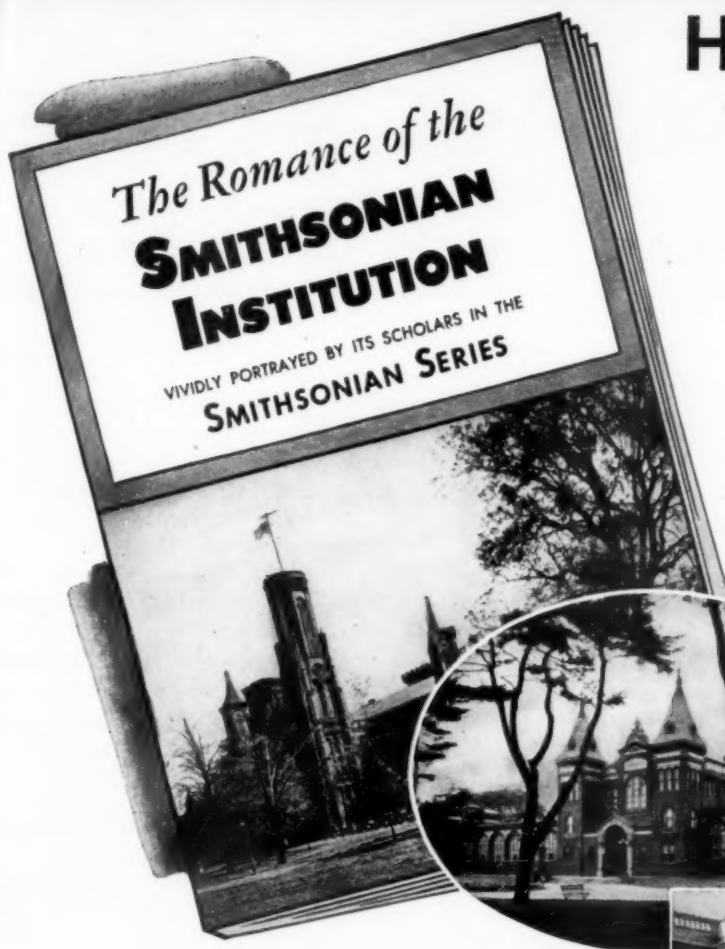
Intensified surveys will also be made in corn, wheat, cotton, and other crop areas. The aerial maps will not only locate the farmhouses but give an accurate estimate of the plantings. Using these maps as a basis for questions, census-takers can gather data in sample areas, which may be applied to similar production areas throughout the nation.

Trained photo-reconnaissance map readers can determine from aerial photos such information as the size of the farm, probable number of horses, cows, chickens, information on farm machinery in use, crops raised, electrical equipment, and many other points.

Aerial maps will be issued to census takers at special schools where map reading will be taught, along with instructions for compiling census information.

Upon completion, the accumulated data will be used to compile special charts from which research analysts will plot trends in farming.

*Science News Letter, October 7, 1944*



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## Do You Know?

Over 1000 factories in Brazil are now making *chemical products*.

Ireland is now raising *bamboo cane* for brush-making, to replace Jap cane.

Mexico is actively looking for *petroleum deposits* for the first time in six years.

Approximately 500,000 barrels of 100-octane *aviation fuel* is produced in the United States daily.

*Buses* now carry more than half the total number of persons transported by intercity public carriers in the United States.

*Dry yeast* prepared from cellulose has been on trial for several months in Sweden as a substitute for meat, it is reported.

Cuts and wounds on oak trees, properly treated with *lanolin*, or wool grease, heal in half the time required by untreated wounds.

An airplane shipment of 10,000 *bees* to Fairbanks, Alaska, from Seattle, Wash., successfully completed, was made to aid in the pollinization of Alaska's increasing farm crops as well as to produce local honey.

### MEDICINE

## Leukemia Weapon

Radioactive sodium used in experiments on laboratory mice reduced the white blood cell count. Work has not advanced to the point of treating humans.

► THE SEARCH for a more effective weapon against leukemia has led scientists at Columbia University College of Physicians and Surgeons to investigate radioactive sodium.

The work has not advanced to the point of treating patients, but the effects of this chemical in laboratory mice were reported by Dr. Edith H. Quimby and Dr. T. C. Evans at the joint meeting of the American Roentgen Ray Society and the Radiological Society of North America, in Chicago.

Familiar to the layman in salt, sodium is one of the elements most readily prepared in its radioactive form in the cyclotron. In the radioactive form, known as radiosodium, it emits penetrating beta- and gamma rays. It has a half-life of 14.8 hours.

Sodium is a normal component of body fluids and if the radioactive form is injected under the skin it is soon distributed uniformly throughout those fluids, including the milk in nursing mothers. The material was found in baby mice within one hour after it had been given to the nursing mothers. The whole body of the animal is irradiated

during the time the material remains active in the tissues.

Unlike radioactive phosphorus, which has been tried in the treatment of patients with leukemia, radioactive sodium is not concentrated in any organ, nor does any organ or tissue show striking lack of the material. Radioactive phosphorus has been found concentrated in the white cells, bone marrow and spleen of leukemic mice.

The general radiation effects of radiosodium are similar to those obtained by X-radiation of the whole body. In normal animals the decrease in white blood cells could be related to the dose of the radiosodium.

A marked increase in white blood cells is one of the characteristics of leukemia. In leukemic mice with moderately high white counts the white cells were found very susceptible to radiosodium. A small dose, 200 microcuries, produced a drop from 35,000 to 9,000 white blood cells in two days. A dose of 500 microcuries produced a drop from 35,000 to 4,000 white blood cells in two days and to 1,500 in four days. The white blood cell counts in the leukemic animals drop more rapidly and lower than in normal mice, but also appear to return to the former levels more rapidly.

Lymph nodes, enlarged in leukemia, show fairly constant regression under the action of the radioactive sodium.

*Science News Letter, October 7, 1944*

### X-Ray Controls Leukemia

► "STRONG evidence" that leukemia can be controlled with small doses of X-ray treatment and that the average longevity cycle is much greater in patients so treated was found by Dr. Bernard P. Widmann of Philadelphia in a study of more than 100 patients.

Many other factors which cannot be evaluated also play a part in the good results obtained, he pointed out.

*Science News Letter, October 7, 1944*

A ton a day of *citric-acid* crystals is the expected output of a new plant at Fazenda, Brazil.



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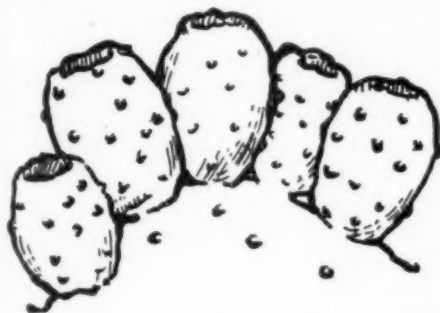
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BOTANY

# NATURE RAMBLINGS

by Frank Thone



## Adaptable Cactus

➤ CACTI are classified simply as desert plants, by most of us, with no further thought given to the matter. So that it comes as a bit of a surprise when we happen upon the prickly plants on the seashore, or on a gravelly prairie hill, or on a sunny rock ledge in the eastern part of the country.

Many persons, finding cacti growing in these seemingly atypical habitats, are prone to assume that they are accidental plantings, perhaps from cultivated specimens thrown away by their owners. Such, however, is not the case. They grow there quite naturally, and in many other odd-seeming places besides.

At least some species of cactus, notably prickly-pear, are quite as much at home on the seashore as they are in the desert. There is, indeed, a good deal of similarity between seashore and desert as plant homes: loose, shifting soil, full exposure to glaring sun and drying wind, uneven and frequently scanty water supply. The sand dunes around our inland seas, the Great Lakes, are also a congenial prickly-pear habitat.

Cacti even grow in the swamp-woods of the Southern coastal plain. To be sure, they do not have their roots in the water, like cattails or bulrushes. They keep their feet daintily above the wet, roosting on the bases of tree trunks and even clambering up them almost like clinging vines. But there they are: swamp cacti.

Along with the notion that cacti belong to the desert, we cling to the idea that they are more or less confined to the warm lands of the South. But at least one cactus species thrives in the far northern valley of the Peace river,

in northwestern Canada. The Peace river flows into Lake Athabaska, which is as far north as Sitka and the middle of Hudson Bay. So although the cactus tribe does have its greatest development in southern countries, at least some representatives of it are able to get along in regions of long winters and deep snow.

Although the whole cactus family is strictly American in its origins, the cacti have proved themselves great trav-

elers and adaptable colonizers. Within a few years after Columbus' voyages, cacti were growing all around the Mediterranean. They are used for hedges in Madagascar and other islands of the Indian ocean, and the common prickly-pear very nearly ruined agriculture and ranching in Australia before an insect enemy, imported for the purpose, laid it low.

*Science News Letter, October 7, 1944*

# "PKR-15"

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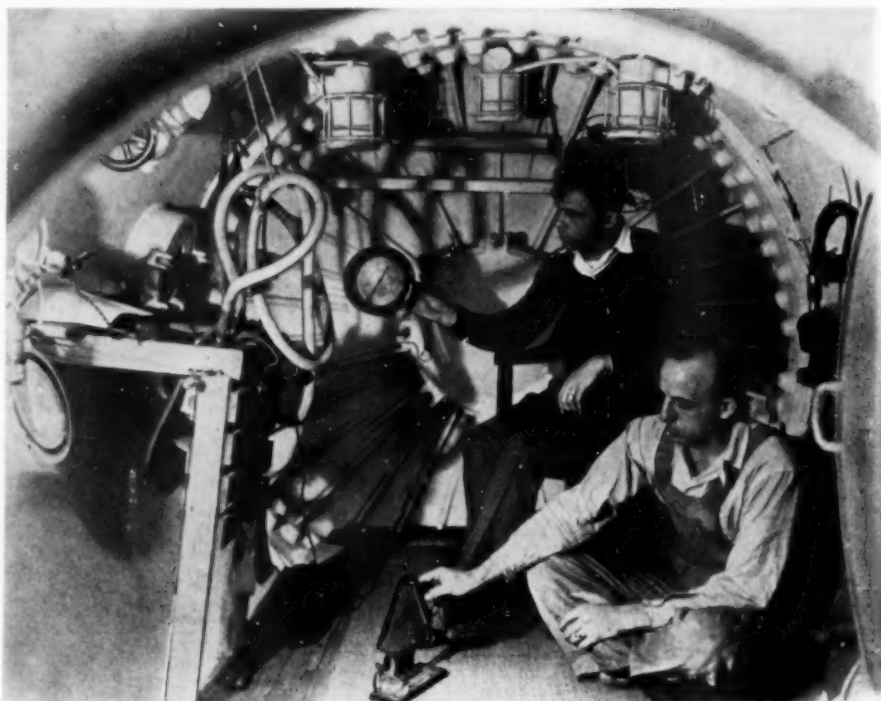
## From Page 231

tissues and collecting at his joints.

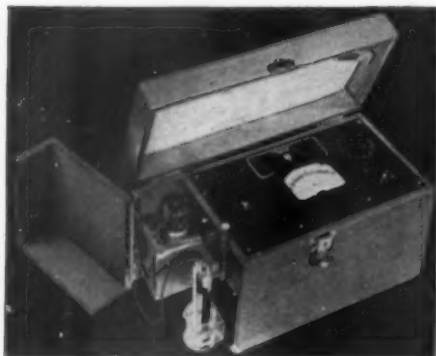
Dr. R. R. Sayers, director of the Bureau of Mines, and his associates worked with Navy Department personnel to develop a helium-oxygen mixture for deep-sea diving, thereby eliminating the nitrogen which may cause the "bends." By using this helium-oxygen mixture, the depth to which deep-sea divers can go has been greatly increased, and the divers are able to work at these greater depths for longer periods of time, and can return to the outside air in a fraction of the time necessary where compressed air is used.

On the basis of somewhat limited experiments, it appears that the helium-oxygen mixture may be of value in preventing "sky bends," a complaint of flyers who go up to altitudes of around 30,000 feet. During descent from high altitudes nitrogen bubbles form in the body by fundamentally the same process that causes them to appear in deep-sea divers.

Ear trouble, the most common complaint of airplane pilots and passengers, can be relieved or prevented by inhaling a helium-oxygen mixture during marked



**TESTING CHAMBER**—The use of helium-oxygen mixtures for diving and caisson work is being tested in the compression chamber shown in this U. S. Bureau of Mines photograph.



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changes in altitude of the plane, especially when descending.

Among other new medical applications of helium are the treatment of pneumonia, asthma and other respiratory diseases in which helium eases the burden on weakened lungs. Asthmatic patients frequently get relief almost instantly by inhaling a mixture composed of helium and oxygen. This is not considered a cure for asthma, but in many cases war workers who suffer from asthma are enabled to keep on the job by taking a whiff of the breathing mixture from time to time.

One of the newest uses for helium is in the heliarc process of welding magnesium. Helium acts as a shield to hold off the oxygen of the air and thus prevents the metal from bursting into flame. The blanket of helium not only smothers any tendency of the metal to ignite, but it makes the joint stronger and less susceptible to corrosion. It is also being used with steels and other metals to produce better welds.

Liquid helium may one day be employed to treat materials such as metals and plastics at extremely low temperatures. Although this field is still largely unexplored, the low temperature of liquid helium, in addition to its other characteristics, may have definite advantages over other cooling agents.

Since it is a better heat transfer agent, and of lower density than air, helium is used with large-capacity dynamo-electric generators to dissipate heat and reduce resistance to rotation of the armatures, thereby increasing the capacity of the generator.

Now used between the lenses of some optical instruments, helium gas curtails errors of vision because it has a low refractive index and high heat transfer. As a coolant, helium used around electrical instruments prevents electric sparks from igniting explosive mixtures which may be present in the surrounding air.

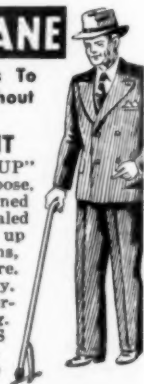
*Science News Letter, October 7, 1944*

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# • Books of the Week •

► **VITAL USES** of chemicals, plastics, dyes, industrial gases and other products of American scientific progress, and the men who made these achievements, are sketched briefly, though clearly, in *THE CHEMICAL INDUSTRY* (Longmans, \$1.75). This is the eighth volume of a series by Josephine Perry that bears the general title "America at Work." It is not a technical book, but it provides the romantic background necessary to the full understanding of science.

*Science News Letter, October 7, 1944*

► **RADAR, FM, TELEVISION**, and other recent developments in radio are included in *MODERN RADIO* by Kingdon S. Tyler (Harcourt, Brace and Co., \$3). Written for the layman, it starts with the radio broadcasting studio and follows the program through the microphone to the loud-speaker in your home, stopping along the way to give the fundamental operating principles of the latest radio tubes, transmitters, antennas, and receivers. It also covers color television. A scientific story that anyone would enjoy reading. Illustrated with drawings and photographs.

*Science News Letter, October 7, 1944*

► **"LONG NAMES"** in botany and zoology are unnecessarily frightening, provided you have any memory at all for a few simple Greek and Latin root words and endings. Edmund C. Jaeger, in *A SOURCE BOOK OF BIOLOGICAL NAMES AND TERMS*, makes this most attractively clear. Once you open the book you have a hard time putting it down again; analyzing names like *Gyrophragmium*, *Lepidodactylon* and *Istiophorus* becomes a fascinating game. It will be a very helpful volume for all biologists, especially all teaching biologists, to have handy. (Thomas, \$3.50.)

*Science News Letter, October 7, 1944*

► **PHOTOGRAPHERS** and scientists alike will find *PHOTOMICROGRAPHY: THEORY AND PRACTICE*, by Charles P. Shillaber, a very valuable book. It tells, in detail and very practically, what needs to be done to make good photographs through the microscope, and what means are required for the doing. Not a book for the dilettante, it is real meat for the professional or the serious amateur. (Wiley, \$10.)

*Science News Letter, October 7, 1944*

## • Just Off the Press •

**AMERICAN BOTANY—1873-1892:** Decades of Transition—Andrew Denny Rodgers—*Princeton Univ. Press*, 340 p., illus., \$3.75.

**BRAZILIAN PORTUGUESE FROM THOUGHT TO WORD**—Frederick B. Agard and others—*Princeton Univ. Press*, 271 p., \$3.

**CARNEGIE ENDOWMENT FOR INTERNATIONAL PEACE YEAR BOOK, 1944**, 160 p., paper, free.

**THE FISHES OF THE FAMILY CHARACINDAE FROM VENEZUELA, WITH DESCRIPTIONS OF SEVENTEEN NEW FORMS**—Leonard P. Schultz—*Smithsonian Inst.*, 367 p., illus., paper, free. From the Proceedings of the United States National Museum, Vol. 95.

**MODELLING FOR AMATEURS**—Clifford and Rosemary Ellis—*Studio*, 79 p., illus., \$1.

**NOTES ON HELICOPTER DESIGN THEORY**—A Series of Lectures Delivered March-April 1944 at Princeton University—Alexander A. Nikolsky—*Princeton Univ. Press*, 228 p., illus., paper, \$3.

**RADIO DIRECTION FINDERS**—Donald S. Bond—*McGraw*, 287 p., illus., \$3. Radio Communication Series.

**REPORT ON THE INCIDENCE OF RICKETS**

**IN WAR-TIME**—British Paediatric Assoc.—*His Majesty's Stationery Office*, 36 p., paper, 25 cents. Reports on Public Health and Medical Subjects, No. 92.

**THEORY OF GAMES AND ECONOMIC BEHAVIOR**—John Von Neumann and Oskar Morgenstern—*Princeton Univ. Press*, 625 p., illus., \$10.

**WOMEN AND MEN**—Amram Scheinfeld—*Harcourt*, 453 p., illus., \$3.50.

*Science News Letter, October 7, 1944*



## Looking Forward

Wartime achievements in science are developing an era of progress which challenges the imagination.

All that Spencer is doing now—producing microscopes, periscopes, telescopes, aircraft and anti-aircraft gunsights, prism binoculars, azimuth instruments for directing artillery fire, tank sights, telescopic alidades for navigation, projectors for instruction—will reap peacetime rewards in advanced knowledge, better manufacturing techniques, finer instruments.

At the war's end, Spencer will be ready to serve scientific optical needs on a far broader scale than ever before.



**Spencer** LENS COMPANY  
BUFFALO, NEW YORK  
SCIENTIFIC INSTRUMENT DIVISION OF  
AMERICAN OPTICAL COMPANY

# •New Machines and Gadgets•

⚙️ **COAT HANGER**, made in two separate parts, consists of slightly curved arms with hook-like sections at one end. One arm is passed through a slot in the other and the hooked ends interlocked to hold the arms extended and form a ring for suspension. It may be easily taken apart for shipping.

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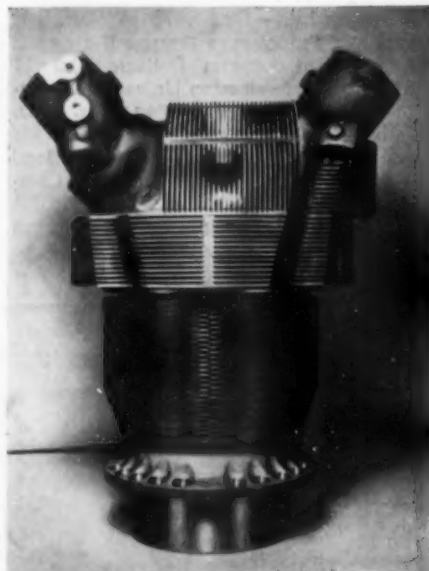
⚙️ **LIGHTED** wall switch plate enables one to find the light switch quickly in a dark room. The plate has a tiny shielded light that comes on automatically when room lights are turned off, and goes off when the lights are turned on. The cost of operating for a year is but a few cents.

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⚙️ **INTERCHANGEABLE** settings for finger rings, brooches and other articles of jewelry are now possible with a newly patented device. The setting holding the stone has a flat bottom and a projecting threaded pin which is screwed into a threaded opening on the flat top of the ring or other base.

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⚙️ **AIR-COOLED** aircraft engine, newly designed, permits greater horsepower output and saves large quantities of critical alloy steel. Aluminum cooling fins on steel cylinder barrels give almost twice the cooling area of all-steel



fin. Sixty aluminum fins, shown in the picture, can be mounted in the space formerly occupied by 40 steel fins.

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⚙️ **BABY WALKER**, a chair or seat in which the baby can sit, stand or walk with safety, has an extended arm anchored to the floor so that the child can walk only in circles. The anchor is a weight with a more or less adhesive rubber base.

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⚙️ **ROLLER SKATES** with toe end bumpers to assist quick stopping, now patented, will enable skaters to do fancy and figure skating with greater ease. The disk-shaped bumper, of a soft wear-resistant material, projects at a downward angle at the front end of the skate and contacts the floor when the heel is raised.

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⚙️ **COFFEE POT**, recently patented, uses a tiny power-driven pump to raise the water into the coffee basket at the top for percolation. In addition to the electric heating unit in the base, there is an electric motor that rotates a magnet which, magnetically, causes rotation of another magnet attached to the shaft of the pump.

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If you want more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, 1719 N. St., N. W., Washington 6, D. C., and ask for Gadget Bulletin 228.

## Question Box

### AERONAUTICS

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How old is the basic principle of jet propulsion? p. 227.

### BALLISTICS

How accurate is the new electronic device for clocking bullets in flight? p. 229.

### EDUCATION

How are Air Force technicians kept up to date? p. 233.

### GENERAL SCIENCE

What is necessary to compete in the annual Science Talent Search? p. 230.

### MEDICINE

How has penicillin production been speeded? p. 232.

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Why have whooping cough vaccines recently received official approval? p. 232.

### MILITARY SCIENCE

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### NUTRITION

Why is blanching advised for commercial dehydrated carrots? p. 232.

### PHYSICS

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What has been the rate of decrease recently in polio cases? p. 229.

Where published sources are used they are cited.

## Change-of-Address Coupon

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